

## 2017-18 Influenza Season Summary Report for New Hampshire October 1, 2017 – May 19, 2018

In New Hampshire (NH), influenza is not a reportable disease, but surveillance systems are in place to help determine the extent of influenza morbidity and mortality in the State. During each influenza season (beginning of October through mid-May), a weekly influenza surveillance report is posted on the NH Department of Health and Human Services' website at the following link: <http://www.dhhs.nh.gov/dphs/cdcs/influenza/activity.htm>. In addition, a weekly assessment of influenza activity in NH is submitted to the Centers for Disease Control and Prevention (CDC) for inclusion in the weekly U.S. influenza surveillance report.

This report summarizes outpatient illness surveillance data reported by NH participants in the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) and by the Automated Hospital Emergency Department Data (AHEDD) system, virologic surveillance data from both the NH Public Health Laboratories (PHL) and participating Hospital Clinical Laboratories, and pneumonia and influenza mortality data from the NH Division of Vital Records Administration.

### New Hampshire Surveillance

#### Outpatient Illness Surveillance

The two components of outpatient illness surveillance in New Hampshire are as follows:

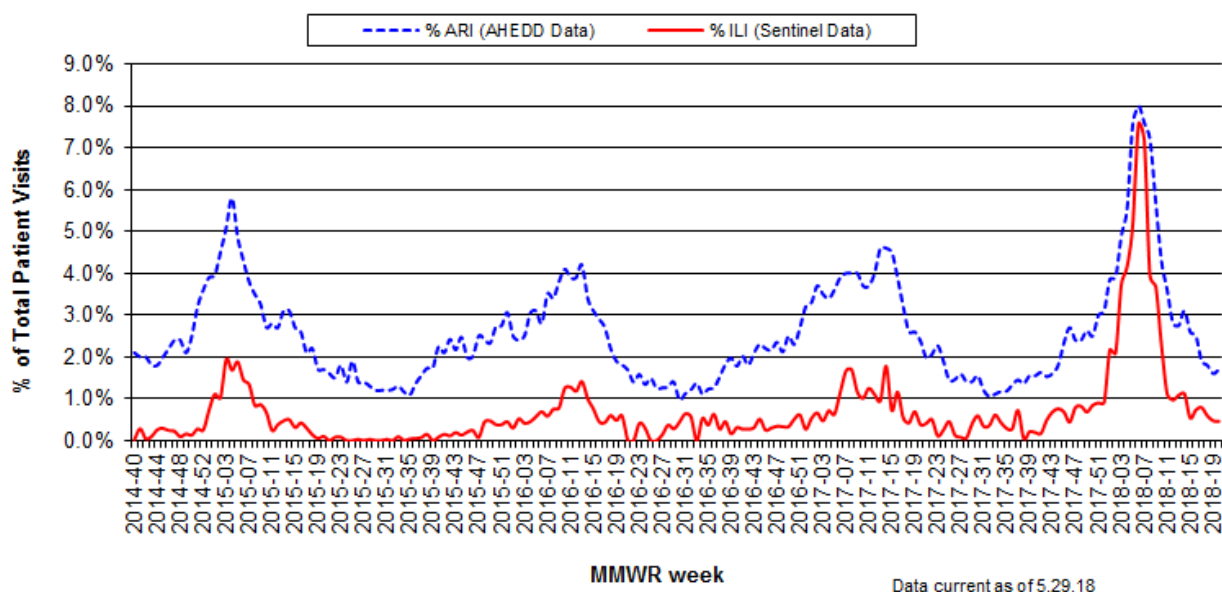
1. **U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet):** Beginning in 1997, NH has participated in this collaborative effort between the Centers for Disease Control and Prevention, state and local health departments, and health care providers. For the 2017-18 influenza season, 18 NH health care providers participated. ILINet sentinel providers reported the proportion of patients who presented with influenza-like illness (ILI) on a weekly basis. ILI is defined as 1) a fever and 2) cough and/or sore throat, in the absence of another known cause. Participating providers were also asked to collect respiratory specimens from select patients and submit them to the PHL for viral subtyping.
2. **The Automated Hospital Emergency Department Data (AHEDD) system:** This system is a collaborative effort between NH acute care hospitals and the NH DHHS. The goal is for all 26 acute care hospitals in the State to participate in this system. For the 2017-18 influenza season, the number of hospitals that electronically transmitted real-time data each week from emergency department encounters throughout the day to NH DHHS ranged between 23-24 hospitals per week. However, data could only be used in a meaningful way for 17-20 of the reporting hospitals due to key changes in how some hospitals report chief complaint text into AHEDD (i.e., changes in method of reporting resulted in challenges at comparing to historical data for determining if respiratory illness was elevated). Chief complaint text within the system was queried for complaints of acute respiratory illness (ARI) in patients seen in emergency departments. While ARI includes encounters that fit the definition of ILI above, it also includes encounters for complaints such as acute bronchitis or otitis media. Because these two systems collect information using different methods and represent different patient populations, it is

expected that the proportions of ILI and ARI seen in these systems will differ. However, the overall trend of activity is expected to be similar.

For the 2017-18 season, reported ILI activity in NH reached its highest levels during MMWR week 6 (week ending February 10, 2018), when the peak percentage of patient visits to NH ILINet providers with patients presenting with ILI was 7.6%. The highest percentage of patient visits due to ARI reported through the AHEDD system was also during weeks 6 (week ending February 10, 2018) when 8.0% of patient encounters in hospital emergency departments were due to ARI. Although both ILI and ARI activity peaked during week 6, both measures of respiratory illness were extremely elevated during the three week period spanning weeks 5 – 7 (weeks ending February 3<sup>rd</sup> through 17<sup>th</sup> of 2018).

Using percent ARI and ILI together as indicators for when flu activity was highest, activity for the 2017-18 season peaked during week 6, when ARI and ILI were at 8.0% and 7.6%, respectively, which is earlier compared to the timing for peak activity in the previous 2016-17 season when activity peaked during week 14 (which was much later than what is normally seen). The peak of activity for the 2017-18 season was within the timeframe of what has been typically seen during previous seasons. The 2017-18 season was much more intense compared to the previous five seasons, as indicated by comparing the peaks for ARI and ILI. For example of the five previous seasons the highest levels of ARI and ILI occurred during the 2014-15 season when they peaked at 5.8% and 1.9%, respectively. See Figure 1 below for ILI and ARI reported during the 2017-18 season and the previous three influenza seasons.

**Figure 1: Acute Respiratory Illness (ARI) & Influenza-like Illness (ILI) as a Percentage of Total Patient Visits Reported through the Automated Hospital Emergency Department Data (AHEDD) System and by NH ILINet Providers, 09/28/14-5/19/18**



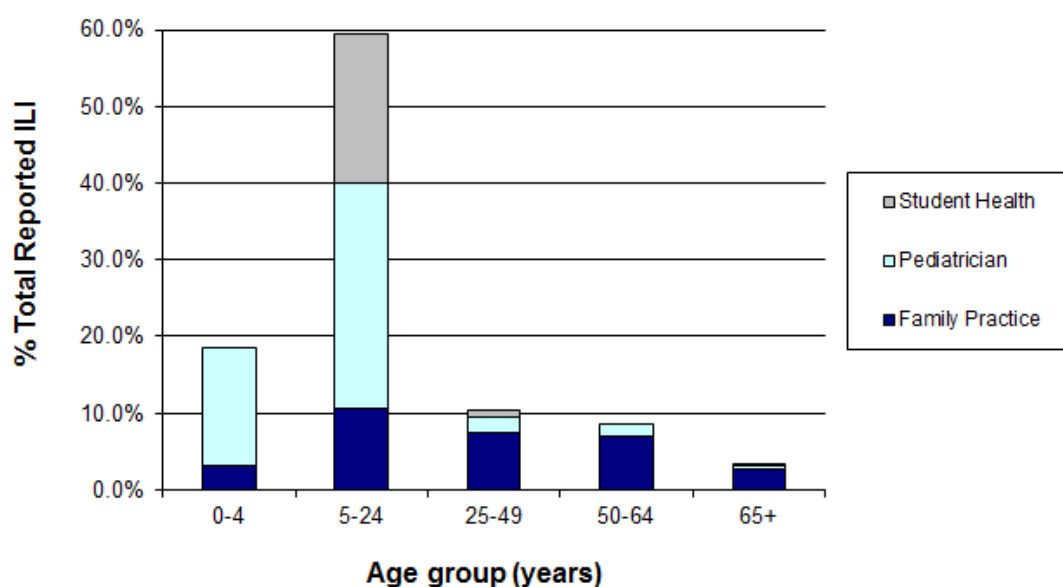
### Reported Influenza-like Illness (ILI) by Age Group & Practice Type

During the 2017-18 influenza season, persons in the 5-24 year age group accounted for the greatest percentage (59.5%) of patients presenting with ILI reported by NH ILINet providers, followed by the 0-4 year age group (18.4%), then by the 25-49 year age group (10.4%). The next highest percentage ILI by age category was in the 50-64 year age group (8.6%) followed by the 65-plus year age group (3.1%). The percentages of ILI cases by age categories were observed to follow the same order of ranking compared

to the previous 2016-17 season. Reported ILI by age groups for the 2017-18 influenza season is shown in Figure 2 and Table 1 below.

Each year there are typically some changes in NH healthcare providers who participate in the U.S. ILINet program. For the 2017-18 influenza season there were 18 providers enrolled in the ILINet program, which is a slight decrease compared to the previous season which had 21. At least 17 (94%) of the 18 providers reported on a regular basis throughout the season. The majority were family practice offices where patients of all ages are seen. There were more patient visits within the family practice category compared to other practice types, such as pediatrics, however, the percentage of visits that were due to ILI tended to be much lower in patients seen at family practices, which explains the observed higher percentages of ILI for the pediatric age groups in table 1 and Figure 2 below.

**Figure 2: Influenza-like Illness (ILI) by Age Group and Practice Type as Reported by NH ILINet Providers, 2017-18 Influenza Season (10/01/17–5/19/18)**



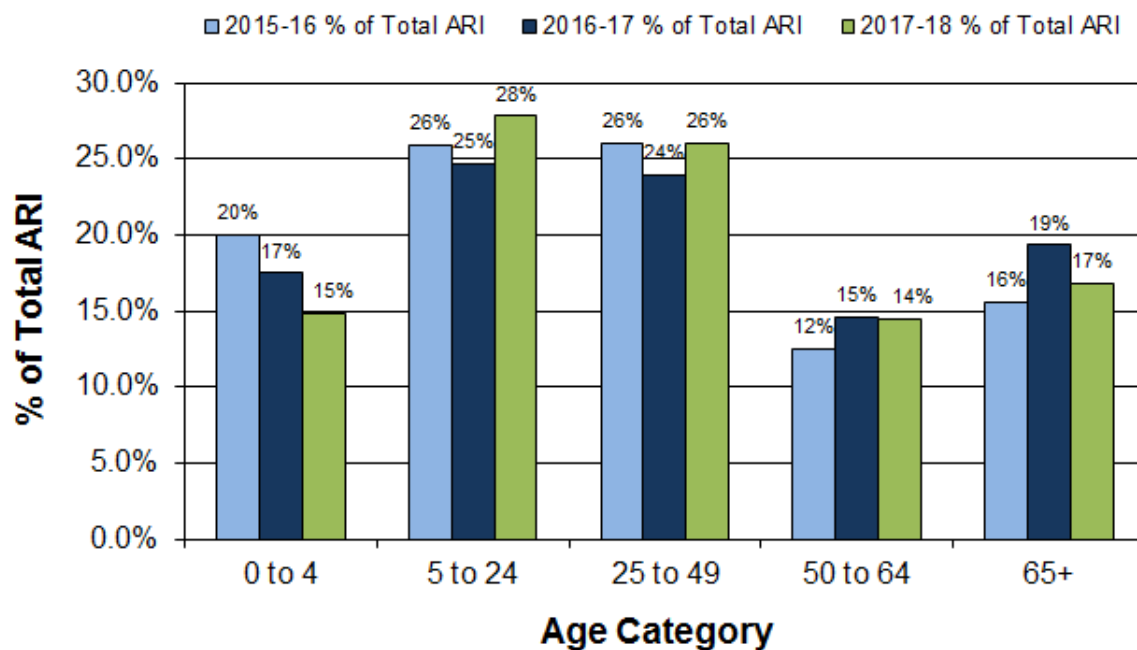
**Table 1: Patient Visits for Influenza-like Illness (ILI) by Age Group and Practice Type, NH ILINet Providers, 2017-18 Influenza Season (10/01/17–5/19/18)**

Practice type	Age Group (years)					Total ILI	Total Patient Visits
	0-4	5-24	25-49	50-64	65+		
Family Practice	51	168	119	110	42	490	66,784
Pediatrics	244	473	34	27	7	785	14,988
Student Health	0	311	13	0	1	325	15,427
Total	295	952	166	137	50	1,600	97,199
% of total ILI	18.4%	59.5%	10.4%	8.6%	3.1%		

### Reported Acute Respiratory Illness (ARI) by Age Group

During the 2017-18 influenza season, persons in the 5-24 and 25-49 year age groups accounted for the largest percent of all ARI encounters in hospital emergency departments at 28% and 26%, respectively (see Figure 3 below). Age groups with the next highest percentage of ARI encounters include 65-plus (17%), 0-4 (15%), and 50-64 (14%). As seen in Figure 3, compared to the 2016-17 influenza season the percentage distributions by age category were slightly higher in the 5-24 and 25-49 year age groups, similar in the 50-64 year age group, and lower in the 0-4 and 65-plus age categories.

**Figure 3: Acute Respiratory Illness (ARI) by Age Group as Reported by NH Automated Hospital Emergency Department Data (AHEDD) System, 2017-18 Influenza Season (10/01/17-5/19/18; N = 14,329 encounters), 2016-17 Influenza Season (10/02/16-5/20/17; N = 10,474 ARI encounters) and 2015-16 Influenza Season (10/04/15-5/21/16; N = 10,776 ARI encounters)**



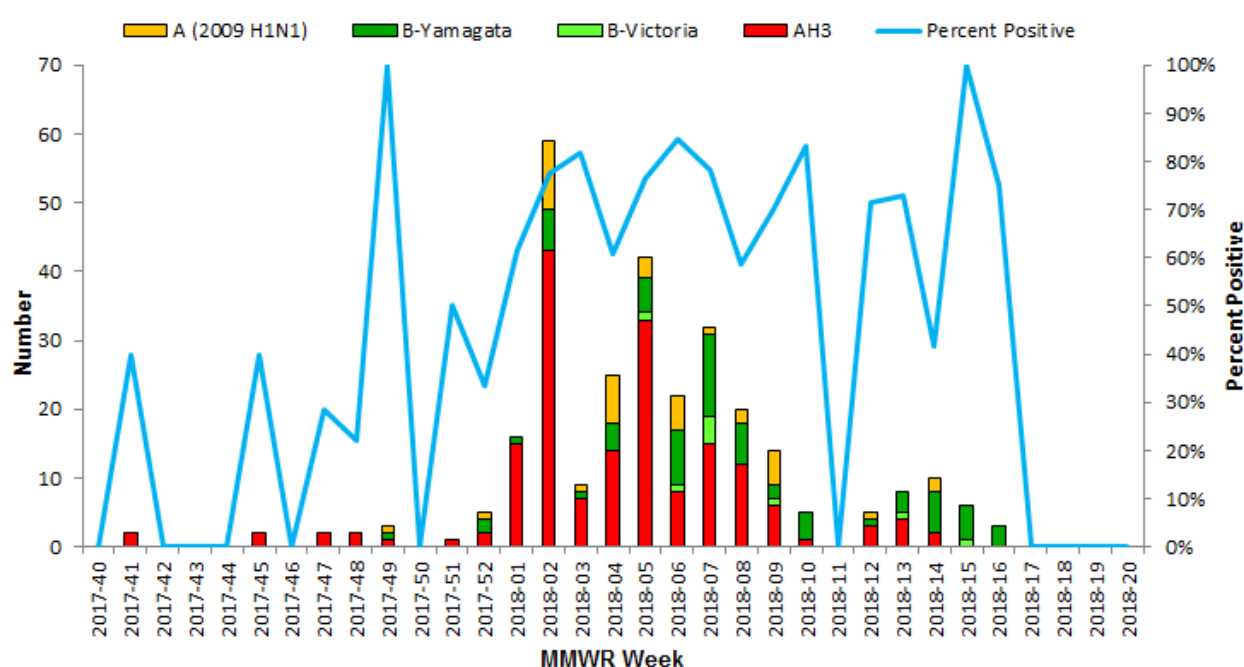
### Laboratory Surveillance

The PHL receives respiratory specimens for influenza testing from ILINet providers, other health care providers and hospitals throughout the State, and from respiratory outbreak settings such as in long-term care facilities. Testing is important to identify circulating influenza viral subtypes, and to confirm specimens that test positive by rapid test. Typically, a large majority of specimens submitted to the PHL have previously tested positive by rapid test in health care provider offices or hospital laboratories. Therefore, it is expected that a high percentage of specimens received by the PHL for influenza testing will be positive. This was observed in the previous 2014-15, 2015-16, and 2016-17 seasons when 57%, 71%, and 66% of total submitted specimens, respectively, tested positive. During the 2017-18 season 65% (n=293) of 451 specimens submitted tested positive for influenza.

The number of positive specimens and subtypes reported for each MMWR week of the 2017-18 season is shown in Figure 4. The first positive specimens were detected at the start of the flu season during MMWR week 41 in early October, when two specimens tested positive for influenza A (H3). Figure 4

depicts the peak for the number of positive specimens (n=59) was during week 2 (ending January 13, 2018). Week 5 (ending February 3, 2018) had the second highest number of positive specimens at n=42, which is in line with what is typically seen during other regular flu seasons when the highest number of positives tend to occur in the month of February. The peak week for positive specimens (week 2) occurred 4 weeks prior to when ILI and ARI activity peaked (during week 6). Although we might normally expect to see such peaks occur closer to the peak week of ILI/ARI, it is noted that both ILI and ARI began to increase significantly in the weeks that followed (weeks 3 – 6). The reasons for this peak in number of positive specimens not mirroring the peak in respiratory illness is unclear, however, based on age of persons who tested positive this surge appeared to be primarily driven by patients in older age groups (50-64 and 65+ years of age), so is not likely to be explained by schools being back in session for the second consecutive week.

**Figure 4: Influenza Virus Isolates, by Viral Subtype, NH Public Health Laboratories, 2017-18 Influenza Season (10/01/17-5/19/18) (N = 451)**



The different viral subtypes that circulated in NH during the 2017-18 influenza season are presented in table 2. Positive isolates consisted of 59.7% influenza A (H3), 13.3% influenza A (H1N1)pdm09, 0% influenza A (unsubtyped), and 27.0% influenza B (including Yamagata lineage and Victoria lineage). In comparison during NH's 2016-17 season positive isolates consisted of 79.8% influenza A (H3), 0.7% influenza A (H1N1)pdm09, and 19.2% influenza B. Compared to the previous 2016-17 season a lower percentage of specimens tested positive for influenza A (H3), and higher percentages were positive for both influenza A (H1N1)pdm09 and influenza B. The NH PHL developed capabilities to test for influenza B lineage, and each of the two lineages were reported out in weekly reports throughout the season. The first influenza B detection this season occurred during week 49, and with the exception of one week (week 11, ending March 17, 2018) these viruses were detected consistently between weeks 52 through 16. Of the 79 total influenza B viruses detected, nine (11.4%) were B-Victoria and 70 (88.6%) were B-Yamagata. The percentage of total positive specimens comprised of influenza B (27.0%) is within the range of what was observed during the previous five influenza seasons (4%-30%).

**Table 2: Results of Specimens Received by NH Public Health Laboratories, 2017-18 Influenza Season (10/01/17-5/19/18)**

Results	# Specimens	% of total positive
Influenza A (H3)	175	59.7%
2009 influenza A (H1N1)	39	13.3%
Influenza B Victoria	9	3.1%
Influenza B Yamagata	70	23.9%
Influenza A (unsubtyped)	0	0%
Negative for influenza	158	
Total	451	

Additional influenza test results are received on a weekly basis from 14 participating hospital clinical laboratories for specimens tested. Supplemental influenza test results reported by participating laboratories are generated by a variety of assays, including real-time polymerase chain reaction (RT-PCR) or rapid influenza diagnostic tests (RIDT). Results reported from clinical laboratories throughout the season allow for determining the weekly percentage of specimens that test positive in our patient population, since these are not pre-screened prior to testing. A summary of weekly results reported for specimens collected throughout the 2017-18 season (a total of 15,835 specimens tested) are summarized in Figure 5, below. The highest percentage (31.4%) specimens tested positive during week 7 (ending February 17, 2018), which is similar to the time when both ARI and ILI peaked (week 6).

**Figure 5: Influenza Positive Tests Reported to NH DHHS by Hospital Clinical Laboratories, 2017-18 Influenza Season (10/01/17-5/19/18) (N = 15,835)**

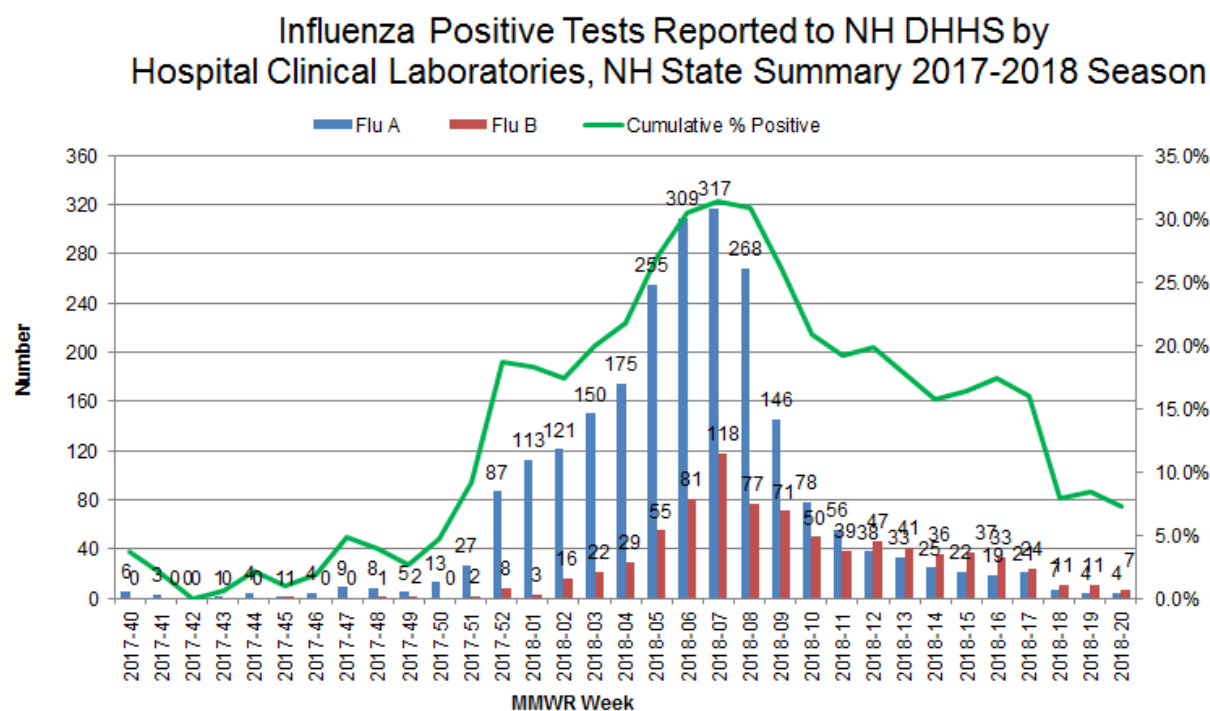
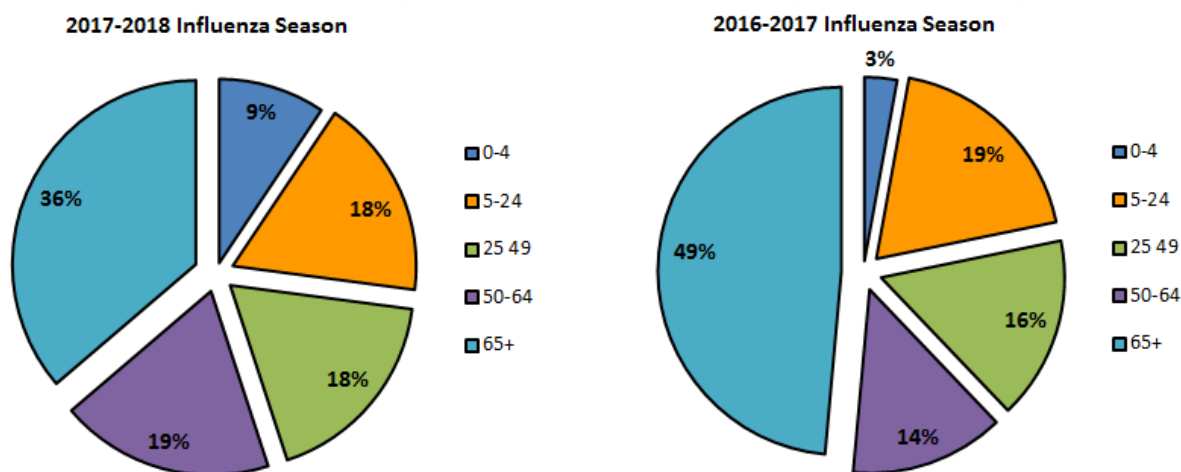




Figure 6 below further describes PHL influenza test results for NH according to different age groups. Compared to the 2016-17 season a lower percentage of positive specimens were observed in the 2017-18 season for the 65-plus year age group (36% vs 49%), while similar percentages were seen for the 5-24 (18% vs. 19% ) and 25-49 (18% vs 16%) year age groups, and slightly higher percentages were observed for the 0-4 (9% vs 3%) and 50-64 (19% vs 14%) year age groups.

**Figure 6: Age Distribution of Laboratory Confirmed Influenza, NH Public Health Laboratories, 2017-18 Influenza Season (10/01/17-5/19/18) and 2016-17 Influenza Season (10/02/16-5/20/17)**



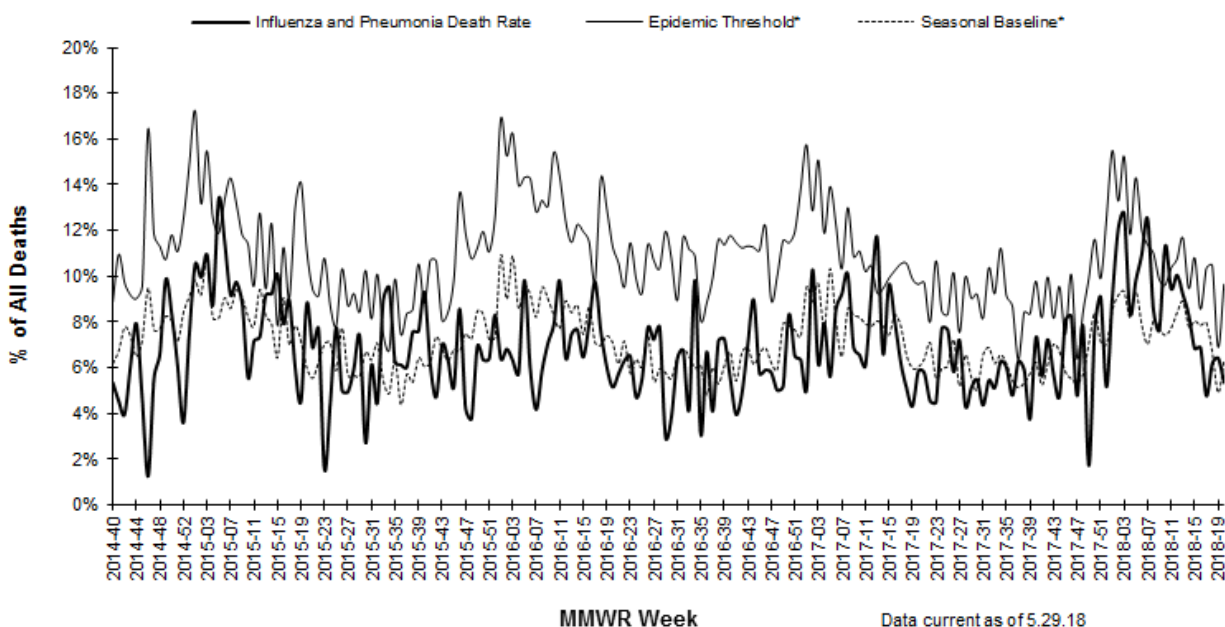
### Regional and National Laboratory Surveillance

Influenza test results reported by CDC for the New England region as a whole indicated the following percentages of each subtype (denominator equals specimens with known subtypes): 62.0% influenza A (H3), 10.8% influenza A (H1N1)pdm09, and 27.2% influenza B. Compared to regional New England data NH had a slightly lower percentage of total positive for influenza A (H3) (59.7% vs 62.0%), a slightly higher percentage positive for influenza A (H1N1)pdm09 (13.3% vs 10.8%), and a similar percentage positive for influenza B (27.0% vs 27.2%). Subtypeable flu results breakdown for the New England Region were similar but slightly different when compared to the national test results, with a slightly higher percentage positive for influenza A (H3) (62.0% vs. 60.0%), similar percent positive for influenza A (H1N1)pdm09 (10.8% vs 10.7%), and slightly lower positive for influenza B (27.2% vs. 29.3%).

### Pneumonia and Influenza (P&I) Mortality

Pneumonia and Influenza (P&I) deaths in New Hampshire are identified through review of electronically filed death certificates by looking at the causes of death listed on each death certificate. The following graph, which shows the proportion of deaths attributed to P&I, represents all deaths recorded by NH's Division of Vital Records Administration. This includes resident and non-resident deaths that occurred within the State, and may not include deaths of NH residents that occurred out-of-state, or cases being investigated by the Medical Examiner's Office.

**Figure 7: Pneumonia and Influenza Mortality, New Hampshire, MMWR Week 40 2014 to MMWR Week 20 2018 (9/28/14-5/19/18)**



*\*Seasonal baseline is calculated using the previous 5 years of data. If the proportion of P&I deaths for a given week exceeds the baseline value for that week by a statistically significant amount (1.645 standard deviations), then P&I deaths are said to be above the epidemic threshold, and the proportion of deaths above threshold are considered attributable to influenza.*

During the 2017-18 influenza season, the percent of all deaths recorded in NH that were reported as due to P&I remained below the weekly epidemic threshold, except for three different weeks, including MMWR week 45, 7, and 10, when respective thresholds were exceeded (see Table 3 below).

**Table 3. Percent of Total Reported Deaths in NH Attributed to Pneumonia and Influenza (P&I) Above the Epidemic Threshold by MMWR Week, 2017-18 Influenza Season (10/01/17-5/19/18)**

MMWR Week	Dates	P&I Deaths (% of Total Deaths)	Weekly Epidemic Threshold
2017-45	11/05/17 - 11/11/17	8.1%	7.5%
2018-07	2/11/18-2/17/18	12.5%	11.4%
2018-10	3/04/18-3/10/18	11.3%	9.6%

Based on electronic surveillance of death certificates a total of 64 influenza-associated NH deaths (deaths where influenza is specifically listed as a cause or contributing cause of death on the death certificate) were observed during the 2017-18 influenza season, which is the highest number of such deaths observed during any season since NH first began tracking this parameter in 1997. All 64 influenza-associated deaths were in adults (i.e., no pediatric influenza-related deaths identified during the 2017-18 season). These influenza-related deaths were identified in all ten counties.



## Influenza Activity in New Hampshire as Assessed by the State Epidemiologist

Influenza activity levels in NH are reported each week to CDC to be included in the national weekly influenza surveillance report. Such activity levels help to describe the degree of geographic distribution of influenza activity. CDC defines influenza activity levels as follows:

- **No Activity:** Low ILI activity and no laboratory-confirmed cases of influenza.
- **Sporadic:** Low ILI activity and isolated laboratory-confirmed influenza cases or a single influenza outbreak has been reported.
- **Local:** Increased ILI activity or influenza outbreaks in a single region of the state, and recent laboratory-confirmed influenza in that region.
- **Regional:** Increased ILI activity or influenza outbreaks in  $\geq 2$ , but less than half of state regions, and recent laboratory-confirmed influenza in affected regions.
- **Widespread:** Increased ILI activity or influenza outbreaks in at least half of state regions, and recent laboratory-confirmed influenza in the state.

In NH, the reported influenza activity level is based on ILI and ARI reported by the Sentinel Providers and the AHEDD surveillance systems respectively, reports of laboratory confirmed influenza, and reported outbreaks in facilities.

In the 2017-18 season, geographic distribution of influenza activity was at a level of either no activity, sporadic, or local activity for weeks 40-46, with the first sign of clearly increased activity observed at week 47 (week ending November 25, 2017), when it reached regional activity. Starting at week 47 of 2017, activity remained at either regional or widespread for a span of 23 weeks, lasting through week 17 of 2018. Activity declined to local, then sporadic, during weeks 18 and 19, respectively, before reaching a level of no activity during week 20.

## National Surveillance

CDC reports that the 2017-18 season was a high severity influenza season with influenza A (H3N2) viruses predominating overall. However, influenza B viruses became more commonly reported than influenza A viruses in early March 2018 through May 2018. This season was characterized by high levels of outpatient clinic and emergency department visits for ILI, high influenza-related hospitalization rates, and elevated and geographically widespread influenza activity across the country for an extended period of time.

In 2017, CDC began using a new methodology to classify influenza season severity using three indicators: 1) the percentage of visits to outpatient clinics for ILI from ILINet, 2) the rates of influenza-associated hospitalizations from the Influenza Hospitalization Surveillance Network (FluSurv-Net), and 3) the percentage of deaths resulting from pneumonia or influenza from CDC's National Center for Health Statistics (NCHS). Based on this method, the severity of the 2017–18 season was classified as high severity overall and high severity for each assessed age group (children and adolescents, adults, and older adults). This is the first time that each age group was classified as high in the same season, in a retrospective analysis going back to the 2003–04 season.

During the 2017-18 season, of the specimens tested at public health laboratories, influenza A viruses predominated nationally (71.2%), with less influenza B viruses (28.8%). Influenza A (H3N2) predominated among influenza A subtyped viruses identified (84.9%) with influenza A (H1N1)pdm09 viruses making up the remainder (15.1%). This is similar to the 2016-17 season when influenza A (H3N2)

predominated. Influenza B viruses were more commonly identified from March onward. Of the influenza B viruses for which lineage were determined, B/Yamagata lineage (88.8%) predominated over B/Victoria lineages (11.2%). With the exception of influenza B/Victoria-lineage viruses, which were a relatively poor match to B/Brisbane/60/2008 vaccine reference virus, the majority of the other viruses characterized during the season were antigenically similar to the reference virus components of the 2017-18 Northern Hemisphere influenza vaccine.

Based on the percentage of specimens testing positive by clinical laboratories for influenza the national peak of influenza activity occurred during week 4 (week ending January 27, 2018), when 26.9% of specimens tested positive. While there were some differences among U.S. Department of Health and Human Services regions observed in the timing of influenza activity (based on percentage of specimens testing positive), region 1 (comprised of the six New England states) peaked during week 6, when 32.9% of specimens tested positive.

### Antigenic Characterization

CDC has antigenically characterized 2,485 influenza viruses collected and submitted by U.S. laboratories since October 1, 2017, including 736 influenza A (H1N1)pdm09 viruses, 655 influenza A (H3N2) viruses, and 1,094 influenza B viruses. Among the 736 influenza A (H1N1)pdm09 viruses characterized, 735 (99.9%) were found to be antigenically similar to A/Michigan/45/2015, the reference virus component of the 2017-18 Northern Hemisphere influenza vaccine. 612 of 655 (93.4%) influenza A (H3N2) viruses were antigenically characterized as A/Michigan/15/2014 (3C.2a HA), the reference virus representing the A/Hong Kong/4801/2014 A(H3N2) component of the 2017-18 Northern Hemisphere vaccine. All 824 (100%) influenza B/Yamagata viruses characterized were found to be similar to B/Phuket/3073/2013 reference virus for the influenza B/Yamagata-lineage component of the 2017-18 Northern Hemisphere quadrivalent vaccines. Fifty-three of 270 (19.6%) influenza B/Victoria-lineage viruses were characterized as B/Brisbane/60/2008, the reference virus representing the influenza B/Victoria-lineage component of the 2017-18 Northern Hemisphere trivalent and quadrivalent vaccines. All 217 of the B/Victoria-lineage viruses that were poorly inhibited by antisera raised to the B/Brisbane/60/2008 had the V1A.1 HA segment, which is a six-nucleotide deletion of the HA gene segment in the clade V1A vaccine reference virus.

### Recommendations for the 2018-19 Influenza Season Vaccines

The Food and Drug Administration has recommended that the 2018-19 influenza trivalent vaccines used in the United States contain an A/Michigan/45/2015 (H1N1)pdm09-like virus, an A/Singapore/INFIMH-16-0019/2016 A(H3N2)-like virus, and a B/Colorado/06/2017-like (B/Victoria lineage) virus. For the quadrivalent vaccine, which has two influenza B viruses, the FDA recommended the viruses referenced above for the trivalent vaccines, as well as including a B/Phuket/3073/2013-like virus (B/Yamagata lineage). These recommendations for the 2018-19 season are a change for the influenza A (H3N2) and influenza B/Victoria lineage virus components compared to the prior Northern Hemisphere season's vaccine.

### Influenza Mortality

During the 2017-18 season, based on data from CDC's National Center for Health Statistics Mortality Reporting System, the proportion of deaths attributed to P&I was at or above the epidemic threshold for 16 consecutive weeks, spanning from week 51 through week 14. The percentage of deaths attributable to P&I peaked at 10.8% during week 3 (week ending January 20, 2018).

Regarding pediatric influenza associated mortality, as of June 1, 2018 there were 171 laboratory-confirmed deaths reported from Chicago, New York City, and 41 states (none were reported in New Hampshire). Among the 171 deaths, 36 were associated with an influenza A (H3N2), 31 were associated with influenza A (H1N1)pdm09, 36 were associated with an influenza A virus for which no subtyping was performed, 64 were associated with influenza B virus, two with an influenza A and B coinfection, and two were associated with an influenza virus for which the type was not determined. As a reference, since influenza-associated pediatric deaths became nationally notifiable in 2004, the total number has ranged from 37 to 171 per season (excluding the 2009 pandemic when there were 358 such deaths reported between April 15, 2009-October 2, 2010).

#### Influenza-like Illness Outpatient Visits

Based on national data reported to CDC via ILINet, for the 2017-18 influenza season, influenza activity as measured by percentage of outpatient visits for ILI peaked nationally during week 5 (week ending February 3, 2018) at 7.5%, and was much higher but occurred at nearly the same time as when ILI peak activity occurred the previous season (5.1% during week 6).

#### National Summary Reports

The Centers for Disease Control and Prevention influenza season summary report can be found on the CDC website at <https://www.cdc.gov/mmwr/volumes/67/wr/mm6722a4.htm>. General information about seasonal influenza, novel influenza, influenza surveillance, and influenza prevention can be found at <http://www.cdc.gov/flu/>.

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All data in this report are based upon information provided to the New Hampshire Department of Health and Human Services under specific legislative authority. The numbers reported may represent an underestimate of the true absolute number and incidence rate of cases in the state. The unauthorized disclosure of any confidential medical or scientific data is a misdemeanor under New Hampshire law. The department is not responsible for any duplication or misrepresentation of surveillance data released in accordance with this guideline.